

Wisconsin Work Zone Field Manual

2021

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Nothing in this manual shall be construed to create a ministerial duty for any highway official to engineer or design a highway facility or a device placed on the facility in a particular manner. The decision to use a particular device at a particular location involves the application of engineering judgment and involves the weighing of the risks created by a design or device against the informative and safety benefits of that design or device.

General Provisions

General Provisions

Pages 3-34

*Drawings Not To Scale

Introduction

This Field Manual contains general Temporary Traffic Control (TTC) standards for Wisconsin state highways. The user shall follow any TTC plans, specifications, and special provisions written for a specific project and then follow the Field Manual for all other layouts. Any work that affects road users (including vehicles, bicycles, and pedestrians) requires proper TTC plans.

The goal of the TTC zone is to provide for the safe and efficient movement of traffic around a location where the normal function of the roadway is temporarily suspended. To accomplish this, the respect of the driver must be earned by appropriate and prudent use of traffic control devices. When work is not in progress or the hazard no longer exists, place TTC devices away from traffic outside of the paved and gravel shoulder surfaces. Remove or lay signs and supports flat on the grade with the uprights oriented parallel to and downstream from traffic.

This Field Manual contains layouts for typical TTC zones ranging from mobile operations to zones which may remain in place for up to three days. If the TTC zone is to remain in one place for more than three days or involves a detour, road closure, or a situation where the typical layouts do not apply, WisDOT's Traffic Engineering staff should be consulted and a project-specific TTC plan prepared. Advance planning is necessary for a successful TTC zone.

This Work Zone Field Manual applies to planned work zone activities which, by their nature, are different from responding to an incident. Prior to completing activities in a work zone or responding to an incident, including debris removal, personnel shall assess current traffic conditions and the risks associated with completing the work and placing traffic control devices when determining the most appropriate technique to accomplish the task. This manual provides layouts illustrating the minimum requirements for temporary traffic control for planned work zone activities based on type of facility, volume of traffic, speed of users, type of activity, and duration of the work.

Prior to starting work, permission shall be obtained from WisDOT. For counties doing maintenance, coordinate with the appropriate WisDOT Regional Maintenance Unit. For all other work, a Permit must be approved by WisDOT.

When used in this Manual, the text headings shall be defined as follows:

- 1. A statement of policy is required, mandatory, or specifically prohibitive practice regarding a traffic control device. The verb **shall** is typically used.
- A statement of guidance is recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. The verb **should** is typically used.
- A statement of optional practice is a permissive condition and carries no requirement or recommendation. The verb may is typically used.

Glossary

Advance Warning Following Distance

The distance in a mobile operation between the Shadow Vehicle and the Work Vehicle. It is used to provide advance warning to traffic that some type of work is being done within the traffic lane. Traffic will have to change lanes, slow down, and wait for a safe time to pass, or adjust their position within the lane to allow for a narrower traffic lane. The Shadow Vehicle shall be equipped with appropriate advance warning signing. Typical Advance Warning Following Distances (L) are included in the TTC Distance Charts. This distance is a range with a minimum of the recommended distance between Advance Warning Signs (A, X, Y, Z), and a maximum of the Decision Sight Distance (D). These distances are dependent upon the roadway and traffic conditions.

Advance Warning Sign Spacing (A, X, Y, Z)

The distance between signs or between a sign and some other location or device within the TTC zone. This distance is determined by the posted speed limit. Signs should be placed to allow adequate time for a motorist to read the signs and react accordingly. Typical Advance Warning Sign Spacings (A, X, Y, Z) are included in the TTC Distance Charts

Advisory Speed

The recommended speed for all vehicles operating on a section of highway based on the highway design, operating characteristics, and conditions.

Average Daily Traffic (ADT)

The average number of vehicles passing a specific point in both directions in an average 24-hour period.

Clear Zone

The work zone clear zone is the unobstructed (clear of obstructions, hazards, or fixed objects), relatively flat area impacted by construction that extends outward from the edge of the traveled way. Because of the limited horizontal clearance available and the heightened awareness of motorists through work zones, recommended clear zones are less than those for the non-construction conditions. Table 1 gives typical clear zone widths that should be provided when roadside space is available.

Posted Speed	Width (ft)		
60 or greater	15' lower minimum; 20' typical		
45-55	10' lower minimum; 15' typical		
40 or less	8' lower minimum; 10' typical		
Bridge project with Temporary Signal, one open lane shared by both directions	12' from open traffic lane		

Table 1: Recommended Clear Zones

Crashworthy

A characteristic of roadside devices that have been successfully crash tested in accordance with the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features" or the American Association of State Highway and Transportation Officials (AASHTO) "Manual for Assessing Safety Hardware (MASH)."

Decision Sight Distance (D)

The total distance traveled during the length of time required for a driver to detect a hazard, recognize its potential threat, select an appropriate speed and path, and perform the required action safely and efficiently.

Downstream Taper

The taper at the end of the activity area which guides traffic back into its original lane. Minimum taper length is approximately 50 feet.

Duration

The length of time any work operation occupies a specific location or causes a traffic obstruction without changing the location. This time is measured from the first disruption to traffic until the total clearing of the area. The following durations are defined in overlapping intervals. Temporary Traffic Control layouts for longer durations may always be used for shorter durations, especially when roadway attributes such as traffic volume and speed, and the work space location may warrant higher levels of traffic control.

- · Mobile work that moves intermittently or continuously
- Short Duration work that occupies a location up to 1 hour.
- Short-Term daytime work that occupies a location for more than 1 hour within a single daylight period.
- Intermediate-Term/Night work that occupies a location more than one daylight period up to 3 days or nighttime work lasting more than 1 hour.
- Long-Term work that occupies a location more than 3 days.

Fixed Object

Hazards that are firm, unyielding, and greater than 4 inches in height along the roadside such as bridge piers, abutments, footings, walls, posts, trees, construction equipment, supplies, stockpiles, and large boulders.

Lateral Buffer Space

The space that separates the traffic space from the work space. It is typically the extra space provided between traffic and workers, excavations, pavement edge drop-offs, or an opposing lane of traffic. Traffic lanes may be closed to provide for lateral buffer space.

Longitudinal Buffer Space (B)

The distance between the transition area and the work space. If a driver does not see the advance warning or fails to negotiate the transition area, a buffer space provides room to stop before the work space. Typical Longitudinal Buffer Spaces (B) are included in the TTC Distance Charts.

Merging Taper (L)

This taper is used on a multi-lane road to close a lane and combine its traffic from that of the adjacent lane. Its length is dependent on the posted speed of the roadway. Higher speeds require a longer distance for traffic to merge lanes. Typical Merging Tapers (L) are included in the TTC Distance Charts.

Off Shoulder

A work space located primarily off of the shoulder, or which causes little or no restrictions on the use of the shoulder. This work space should have little or no interference with traffic such that traffic speeds generally are not reduced.

Portable Changeable Message Sign (PCMS)

A sign either trailer-mounted or vehicle-mounted that is capable of displaying more than one message, changeable by remote or automatic control.

Posted Speed Limit

The speed limit determined by law and shown on regulatory speed limit signs. It is used in the Temporary Traffic Control Distance Charts to determine the spacing of TTC devices and the lengths of various tapers on the TTC layouts.

Protection Vehicle

The vehicle that is placed in advance of the work space and equipment to block errant motorists from entering work area.

Roll Ahead Distance (R)

The recommended minimum distance from the front of the Protection Vehicle to the beginning of the work space. A Protection Vehicle may be used in a mobile operation to provide extra safety for the workers. R is defined by the manufacturer of each TMA and shall be used.

Shadow Vehicle

Vehicle(s) placed in advance of the work space in a mobile operation to provide advance, warning to motorists. If Shadow Vehicle operates completely or partially in the live traffic lane it shall have a TMA.

Shifting Taper

The taper used to move traffic from the traffic lane onto a by-pass, shoulder or another traffic lane.

Shoulder Closure

A closure of the roadway shoulder for work operations. The shoulder becomes unusable by traffic for vehicle maneuvers or break-downs. TTC layouts for work operations using or on a shoulder are dependent on the type of shoulder usage and duration.

Shoulder Taper

The taper used to close the shoulder to traffic so that shoulder work can be performed or equipment can be placed on the shoulder. Since this taper is used to guide errant traffic back into its normal lane path, it does not require a full merge distance. The taper length is reduced to one-third of a merging taper length. See Figure 9, TTC Distance Charts for the length of a shoulder closure taper (L/3).

Termination Area

Part of the TTC zone located beyond the work area which guides traffic back into its normal path.

TMA (Truck/Trailer Mounted Impact Attenuator)

Energy-absorbing devices attached to the rear of vehicles in work zones that primarily reduce the severity of impacts from errant vehicles.

Transition Area

Part of TTC zone that moves traffic from its normal path or lane into the traffic space by using channelizing devices and directional signing.

Work Area

Part of TTC zone closed to traffic and set aside for workers, equipment and materials. Work Zone

Work Zone

An area of a roadway where road user conditions are changed because of a work space by the use of TTC devices, flaggers, uniformed law enforcement officers, or other authorized personnel. Wisconsin State Statute 349.065, states Local authorities shall place and maintain traffic control devices upon highways under their jurisdiction to regulate, warn, guide or inform traffic. The design, installation and operation or use of new traffic control devices placed and maintained after the adoption of the uniform traffic control devices manual under Wisconsin State Statute 84.02(4)(e) shall conform to the manual. After January 1, 1977, all traffic control devices placed and maintained by local authorities shall conform to the manual.

340.01(22e) "Highway maintenance or construction area" means the entire section of roadway between the first advance warning sign of highway maintenance or construction work and an "END ROAD WORK" sign or, in the case of a moving vehicle engaged in the maintenance or construction work, that section of roadway where traffic may return to its normal flow without impeding such work.

Work Zone Speed Limits

A regulatory speed limit in a TTC zone. If workers are present within 12 feet of live traffic without positive protection on a posted 70 or 65 mph roadway, the speed limit shall be lowered to 55 mph. If work is taking place outside the clear zone, do not lower the speed limit. Do not reduce the speed on 70 and 65 mph facilities lower than 55 mph. Document the reduced regulatory speed in LCS or in the Permit. If work area is less than or equal to 0.5 miles in length with no lane shifts or narrowed travel lanes and positive protection, then do not lower the speed limit.

Temporary Traffic Control General Guidelines

Individual Responsibilities

The user shall follow any TTC plans, specifications, and special provisions written for a specific project and then follow the Field Manual for all other layouts. Qualified individuals who have adequate training in Temporary Traffic Control and have a basic understanding of the Wisconsin Manual on Uniform Traffic Control Devices (WMUTCD) should supervise the selection, placement, and maintenance of traffic control devices in TTC zones.

General Responsibilities

Except where otherwise specified, any public or private agency performing work within the right-of-way of streets or highways open to public travel shall be responsible for:

- Supplying, installing, and maintaining all necessary traffic control devices outlined in this manual and as stipulated by the road authority to protect the work space and safely direct traffic around the TTC zone.
- Supplying their own flagger(s) when required.
- Informing occupants of abutting properties, either orally or by written notice, of parking prohibitions or access limitations.
- Notifying WisDOT when existing traffic signs need to be removed or relocated or when any regulatory sign must be installed for construction or maintenance work.
- Replacing or reimbursing WisDOT for any damage to or loss of existing traffic signs or devices.
- Prior to beginning work, check all equipment and devices to make sure everything is working properly.
- Keeping all traffic control devices clean and in proper position to ensure optimum effectiveness.
- Removing traffic control equipment when it is no longer required or appropriate.
- Performing and documenting routine day and night inspections of the TTC zone.

Lane Closure System

Provide the following advance notification for incorporation into the Wisconsin Lane Closure System (LCS). Any closure 30 minutes or greater in duration requires an entry in the Lane Closure System, LCS. Closures less than 30 minutes in duration will not require an LCS entry.

CLOSURE TYPE AND REQUIRED MINIMUM ADVANCE NOTIFICATION

Closure type with height, weight, or width restrictions (available width, all lanes in one direction <16')	MINIMUM NOTIFICATION	
Lane and shoulder closures	7 calendar days	
Full roadway closures	7 calendar days	
Ramp Closures	7 calendar days	
Detours	7 calendar days	
Closure type without height, weight, or width restrictions (available width, all lanes in one direction ≥16')	MINIMUM NOTIFICATION	
Lane and shoulder closures	3 business days	
Ramp closures	3 business days	
Modifying all closure types	3 business days	

Width Restrictions and Lane Closure System

Example 1

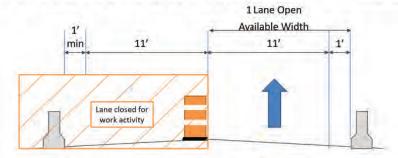


LCS Entry \rightarrow (1' + 11' + 11' + 1') - 1' buffer = 23' effective width

Available width ≥ 16': No width warning sign required.

Width Restrictions and Lane Closure System

Example 2



LCS Entry $\rightarrow (11' + 1') - 1'$ buffer = 11' effective width

Width Signing → 11' Max Width

Available width < 16':

Width warning sign(s) required.

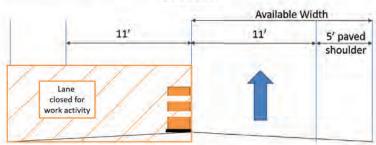
Recommend 2 Locations:

- · One in WZTC advanced warning area
- One at location where a wide load could exit with supplemental XX AHEAD sign below

Width Restrictions and Lane Closure System

Example 3

2 Lane Open



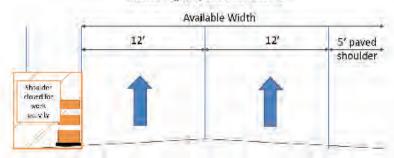
LCS Entry
$$\rightarrow (11' + 5') - 1'$$
 buffer = 15' effective width

Available width ≥ 16': No width warning sign required.

Width Restrictions and Lane Closure System

Example 4

Divided Highway Shoulder Closure



LCS Entry
$$\rightarrow$$
 (12' + 12' + 5') - 1' buffer = 28' effective width

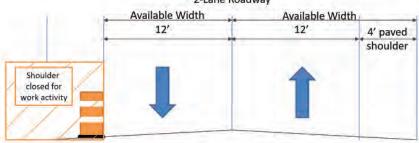
Available width ≥ 16': No width warning sign required.

Not changing the typical width available for this facility.

Width Restrictions and Lane Closure System

Example 5

Shoulder Closure, 2-Lane Roadway



SB LCS Entry \rightarrow (12') – 1' buffer = 11' effective width

Width Signing > 11' Max Width

Available width < 16': Width warning sign(s) required. Recommend 2 Locations:

- · One in WZTC advanced warning area
- One at location where a wide load could exit with supplemental XX AHEAD sign below

Permission to Work Within the Right-of-Way

Prior to starting work, permission shall be obtained from WisDOT. WisDOT Regional Offices may limit the hours of work or have other requirements such as detours, parking restrictions, etc. Peak traffic periods vary by hour or day-of-week and all work should be scheduled during non-peak hours.

Follow the above LCS guidelines prior to beginning work on the Wisconsin State Highway System.

When working in or near an intersection with a traffic control signal system, the road authority with jurisdiction over the signal should be contacted to ensure proper operation of the signal while the work is in progress.

Any work requiring traffic control to extend across a railroad right-of-way requires coordination with the railroad authority.

Selecting an Appropriate Temporary Traffic Control Layout

The Field Manual has been organized such that field personnel are able to determine the proper Temporary Traffic Control layout(s) for the work zone they need. The layouts are divided primarily by the type of roadway and type of work space. The roadway designations are:

- 1. Low Volume Rural/Residential.
- 2. Two-Lane, Two-Way Roads (low, intermediate, and high volumes),
- 3. Roads with Two-Way Continuous Left-Turn Lanes,
- 4. Multi-Lane Undivided Roads, and
- 5. Multi-Lane Divided Roads.

After determining the type of roadway upon which the work space will be located, the type of work space needs to be determined. The work space is the area within the right-of-way that will be closed from normal usage. It includes all the area needed by support equipment, materials, workers, and vehicles. It may require the closing of a lane(s), the shoulder(s) of the road, or turn lane(s) within an intersection. The work space may even be completely off the roadway shoulder such as on side-slopes or along sidewalks. The layouts are listed by the typical work space areas. Continuity for existing road users (vehicles, pedestrians, and/or bicyclists) needs to be provided by the temporary traffic control. If variations are made, discuss changes with WisDOT Regional personnel for approval and properly document the agreed upon changes.

All distances shown on the layouts and charts are approximate. In general, all chart distances vary based upon the posted speed limit. Adjustments to these distances should be made based on traffic entry points and decision sight distance.

Additional layouts have been placed in this manual for unique operations and special signing conditions. These layouts may have special restrictions and guidelines contained within their notes.

Enhancement of Temporary Traffic Control Layouts

To improve safety, typical layouts contained in this manual may need to be modified to fit more complex roadway conditions or operations. When conditions are more complex, modifications may incorporate devices and practices from the following list:

- 1. Additional Personnel
 - b. Spotters
 - c. Law Enforcement
 - d. Multiple Flaggers
- 2. Additional Devices:
 - a. More signs or enhanced signs (using LEDs, flags, beacons, etc.)
 - b. Flashing arrow board(s)
 - c. More channelizing devices at close spacing
 - d. Temporary raised pavement markers
 - e. High-level warning devices
 - f. Portable Changeable Message Sign(s) (PCMS)
 - g. Portable traffic signals
 - h. Protection vehicles
 - i More delineation
- 3. Upgrading of Devices
 - a. A complete set of standard pavement markings in high hazard areas
 - b. Brighter and/or wider pavement markings
 - c. Larger and/or more retroreflective signs
 - d. More visible channelizing devices with greater conspicuity
- 4. Lateral Buffer Space or Closing an Additional Lane
- 5. Closing Shoulders with Shoulder Tapers and/or Protection Vehicles
- 6. Increased Distances
 - a. Longer advance warning area
 - b. Longer tapers
- 7. Lighting
 - a. Temporary roadway lighting
 - b. Steady burn lights used with channelizing devices
 - c. Flashing lights for isolated hazards
 - d. Illuminated signs
 - e. Work space lighting
- 8. Work zone speed limits
 - a. Contact the road authority

Installing the Temporary Traffic Control Zone

Traffic control devices shall be installed in the order that drivers will see them, starting with the sign or device that is furthest upstream from the work space. If traffic in both directions will be affected, such as work in the center lane(s), the devices may be placed in both directions at the same time. When one direction of traffic will be directed into the opposing lanes of traffic, all traffic controls for the opposing traffic should be installed first.

When space constraints become an issue, lane widths may be narrowed. Lane widths may be reduced to 10 feet. Make sure to consider freight movements within the narrow lanes. When this is considered, also look at the shy distance from roadside hazards. After the Temporary Traffic Control (TTC) zone is in place, it should be inspected by driving through the zone. Motorists' actions and reactions should be noted and any problems encountered should be quickly corrected. Any modifications to the Temporary Traffic Control Plan or standard layouts and the reasons for the modifications should be documented. For additional lane width restrictions below 10', consult with DOT Regional Traffic.

During the life of a TTC zone, maintenance of devices is frequently needed. On short term operations, vehicles may knock over devices which then need to be placed upright. Problems encountered should be corrected immediately and documented.

Inspecting the Temporary Traffic Control Zone

To provide acceptable levels of operations and to maintain safety, routine day and night inspections of the TTC zone should be performed by knowledgeable personnel. See page 15, SAMPLE PROJECT INSPECTION CHECKLIST for an example inspection sheet that an inspector may use.

Removing the Temporary Traffic Control Zone

Traffic control devices should be removed as soon as the work is completed and they are no longer needed. Devices should be removed in the opposite order from which they were installed, especially devices in the termination, activity, and transition areas. Devices in the advance warning area may be removed in the order they were installed. Alternatively, a Mobile Lane Closure may be used to remove the TTC devices in the order that they were installed. Once the termination, activity and transition area devices are removed, then take down the advance warning signs.

Crossing Live Lanes of Traffic

Personnel may cross live traffic lanes only if it is safe to do so utilizing a walking pace taking into consideration roadway geometry, traffic volume, and other appropriate factors. Do not drag or carry TTC devices from one side of the roadway to the other side.

Roadside Safety

Attention should be given to the maintenance of roadside safety during the life of the TTC zone.

In urban areas with curbs, wide clear zones are typically much more difficult to achieve; in these areas, a minimum lateral offset to obstruction of 1.5 feet should be provided behind the curb face.

When work is not active, hazards or fixed objects should not be left or placed within the clear zone distance from Table 1, depending on the road environment. If not practical to remove hazards or fixed objects, they should be protected with temporary barrier. If not practical to provide temporary barrier, hazards or fixed objects shall be delineated with channelizing devices.

Marking Hazards

Damaged infrastructure (such as washouts, damaged guardrail, impacted end treatments and light poles) should be repaired as soon as possible (based on agency priorities); however, until the repair occurs, these hazards should be marked with either a Type II barricade with a Type A flashing warning light or a retroreflectorized drum. Cones may be used for short-term emergency situations.

Certain construction operations may leave structures (manhole covers, drainage structures, etc.) exposed above the grade or dropped below the grade in the traffic space of the activity area. These shall be made apparent so that drivers, bicyclists, and pedestrians are able to avoid them or slow down to minimize the hazard.

Use drums, barricades, and temporary barrier to delineate and shield abrupt drop-offs and other hazards.

The following items should be addressed for

Checklist for Establishing Temporary Traffic Control Zone

esta	ablishing a Temporary Traffic Control Zone
	Obtain permission from all affected road authority(ies).
	Determine the type of roadway.
	Determine the type of road users (vehicles, pedestrians, bicyclists).
	Determine the type of work space.
	Determine the duration of work.
	Select hours of work to avoid peak periods.
	Select the appropriate layout(s) using: Type of roadway, type of work, duration, traffic volume, speed, and impact on pedestrian and bicycle travel (see the appropriate Index Chart at the start of each section). Review all notes on layout(s).
	Determine any modifications to typical layout(s).
	Check Decision Sight Distance(s) (D).
	If possible, maintain access to intersections, parking areas, driveways (public and private), and mass transit.
	Coordinate with mass transit if needed.
	Allow for buffer space free of obstructions.
	Contact the road authority if the work zone interferes with normal signal operation in the area.
	Check the condition and orientation of devices (see Quality Standards).
	Install devices beginning with the first device the driver will see.
	Conduct a drive-through to check for problems, modify as needed.
	Document Temporary Traffic Control zone problems and major modifications to the layouts.
	Observe traffic to see if the TTC is working correctly.
	Remove or cover the devices as soon as work is suspended or completed.

Sample of State Inspection Project Inspection Checklist

PROJECT			
ITEM	YES	NO	HOW MANY?
1. Are any devices missing? Do any devices need repair? Were all replaced or repaired? 2. Are any lights (flashers, etc.) not functioning? Were they all replaced or repaired? 3. Are any devices improperly placed? Were all positions corrected? 4. Do any devices need cleaning? Were all devices cleaned?			
ADDITIONAL COMMENTS ON THE BACK OF THIS FORM?			
The above check was completed by	(name/til	de)
on at	(time)	a	ı.m. 🔲 p.m. 🗀